Paper No. 39

TITLE: CELLULOSE AND MODIFIED CELLULOSE AS PRECURSORS TO CATECHOL IN CIGARETTE SMOKE

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ABSTRACT: Our previous work indicated that tobacco cellulose might be an important precursor to catechol in mainstream smoke. To investigate this possibility, we added ^{14}C-cellulose (3 x 10^7 dpm/g tobacco) to IR1 cigarettes and the mainstream smoke was analyzed for ^{14}C-catechol. The levels of ^{14}C-catechol were determined by scintillation counting of ^{14}C-catechol-TMS ether isolated by gas chromatography. The identity of ^{14}C-catechol-TMS ether was confirmed by thin layer radiochromatography and by hydrolysis followed by high-performance liquid chromatography. The percentage conversion of cellulose to mainstream smoke catechol was 0.04-0.05%. These results indicate that cellulose is a major precursor to catechol in mainstream smoke. In agreement with this concept, an experimental non-tobacco cigarette containing 27.5% sodium carboxymethyl cellulose and 60% inorganic materials yielded only 23 µg catechol/cigarette in mainstream smoke. These results suggest that modification of tobacco cellulose could lead to lower levels of smoke catechol. To test this idea, comparative pyrolysis experiments were carried out. When cellulose was pyrolyzed at 500°C under N_2, the yield of catechol was 0.2%; the corresponding yield from carboxymethyl cellulose was 0.06%. The results of pyrolysis experiments on other synthetic cellulose derivatives and on modified tobacco cellulose will be reported.

REVIEW: This paper was a continuation of work presented at the 35th TCRC which showed that approximately 46% of catechol in mainstream cigarette smoke is formed from cellulose. Background work was presented describing the procedures for modifying cellulose, such that lower levels of catechol in smoke would be produced. Some testing concerned the pyrosynthesis of cellulose in a wide range of air and nitrogen concentrations. It was noted that the highest catechol yield occurred at 550-650°C regardless of the atmospheric composition. Testing showed that the yield of catechol from cellulose carbonate was poor when compared to unmodified cellulose. Also, it was stated that the catechol yield from cellulose acetate decreases with temperature, while the yield from cellulose propionate increases. The lowest catechol yield was produced by carboxymethyl cellulose; however, combustion problems exist with this modified cellulose.

-Reviewed by R. Wagoner